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CIA HISTORICAL REVIEW PROGRAM
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MEMORANDUM FOR: Chief,

Office of Scientific Intelligence

SUBJECT : Response to Questions Concerning the
Transfer of Semiconductor Technology to
the USSR.

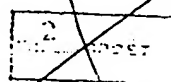
1. Attached is a formal response to your questions concerning the transfer of semiconductor technology from the West to the USSR, and the possibilities for transfer under the US-USSR bilaterals. These answers were given to you informally on 4 March.

2. If additional information or clarification is desired, please contact _____ 5907

Office of Economic Research

Attachment:
as stated

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ATTACHMENT

Transfer of Semiconductor Technology to the USSR

- I. Question: What (legal/illegal) transfers of semiconductor technology to the USSR have taken place to date?

Before detente the USSR purchased a few items of equipment for manufacturing semiconductors, mostly in Western Europe and Japan. These purchases were of little significance, however. In the earliest case (in the early 1960s), the USSR purchased about 30 germanium ingot slicing machines from Japan. Although these machines may have increased substantially the output of germanium wafers for diodes and transistors, they could not have affected the quality of output. More recently, 1970-71, the USSR acquired diffusion furnaces from the UK in connection with the Italian FIAT contract to build a passenger car facility at Tol'yatti. The furnaces were intended to be used to manufacture diode rectifiers for car alternators. For several years, Switzerland (a non-COCOM country) has been selling unknown quantities of thin-film evaporation equipment to the USSR, probably for hybrid circuits. The US has sold a large number of chemical milling machines (spray etchers) to the USSR since 1969. Strictly speaking, these are not items of semiconductor production machinery, but of a very closely related technology; they are used in the fabrication of printed circuit boards and lead frames, both of which are needed for mounting semiconductor devices.

The Soviets also have acquired semiconductor machinery and technology through illegal channels. These acquisitions may have had a significant impact on Soviet semiconductor production capabilities. Although most reports of illegal purchases are allegations that are difficult to verify, it seems almost certain that the USSR has acquired the following: a complete line for the production of integrated circuits, a process manual for manufacturing ICs, diffusion furnaces, and testing equipment.

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II. Question: Which science and technology agreements could involve transfers of semiconductor technology to the USSR?

(A) US-USSR bilateral agreements?

The cooperative agreement on "Standards and Standardization" is the only one to date that specifically mentions semiconductors. That agreement, which provides for a joint working group in the area of standardization of integrated circuit testing, could constitute an avenue for the transfer of US semiconductor technology to the USSR. Computerized testing, which is crucial to the attainment of economic production yields is an area in which the USSR is not very advanced. Other areas of cooperation under the bilaterals that could result in gains to the USSR in semiconductor technology include:

Microbiology: Working Group on "Engineering research and methods for the computerized simulation, design and control of processes for microbiological technology".

Oceanography: Working Group on "Intercalibration and standardization of oceanographic instrumentation and methods".

Science Policy: Working Group on "Systems for the support of fundamental science".

Energy: Working Group on "Photovoltaics". Basically this covers solar cells. However, the technology involved is similar to that used in the fabrication of photodiodes and photo-transistors, which are of strategic importance.

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Water Resources: Working Group on "Use of equipment, automatically controlled, for two-way transmission of information to control panels and devices. This includes joint work on systems analysis and up-to-date computer technology.

(B) Agreements between USSR and private US firms?

Electronic component technology has been mentioned in several science and technology agreements between the USSR and US firms. Specific US firms which reportedly have signed or are negotiating agreements with the USSR involving electronic component technology include:

These agreements offer the prospect of a significant transfer of technology through direct sale, visits to US production facilities, and exchange of information.

III. Question: What are Soviet semiconductor capabilities: i.e., how many years are they behind?

We estimate that, overall, Soviet semiconductor technology and production lags at least five years behind that of the US. There are, of course, specific areas of semiconductor technology where Soviet developments are not far behind US work -- for example, in the laboratory development of some semiconductor materials. But Soviet capabilities lag significantly in the area of applied research and development and, especially, in industrial scale production.

In terms of production, Soviet output is small relative to that of the US. In the area of integrated circuits, Soviet output in 1973 is believed to have been less than 10% that of the US. Moreover, the Soviet IC product-mix is made up mainly of low density devices (SSI: small-scale integration) comparable to US state-of-the-art of about 1968. The Soviet technological lag is greatest in MOS, LSI, linear ICs, high voltage devices (SCRs), and in advanced types of solid-state microwave devices, with the exception of tunnel diodes.

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